Advancing Patient and Population Health Through the Use of Data & AI

June 5, 2025

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Session Objectives

- Articulate commonly accepted definitions of data, analytics and artificial intelligence (AI)
- Evaluate a framework for assessing analytic maturity in healthcare organizations
- Describe how data and AI are currently being used in North Carolina and by healthcare organizations

Commonly Accepted Definitions

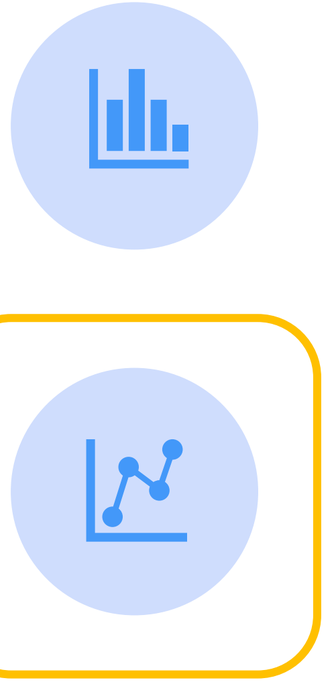
Data, Analytics & Artificial Intelligence

Common Definitions

Data: Structured or unstructured facts collected from various sources—such as electronic health records, claims, or patient surveys—that serve as the foundation for analysis and decision-making.

Data, Analytics & Artificial Intelligence

Common Definitions



Analytics: The systematic use of data, statistical analysis, and modeling to uncover insights, identify patterns, and support decision making.

Descriptive: What happened?

Diagnostic: Why did it happen?

Predictive: What might happen?

Prescriptive: What should we do?

Data, Analytics & Artificial Intelligence

Common Definitions

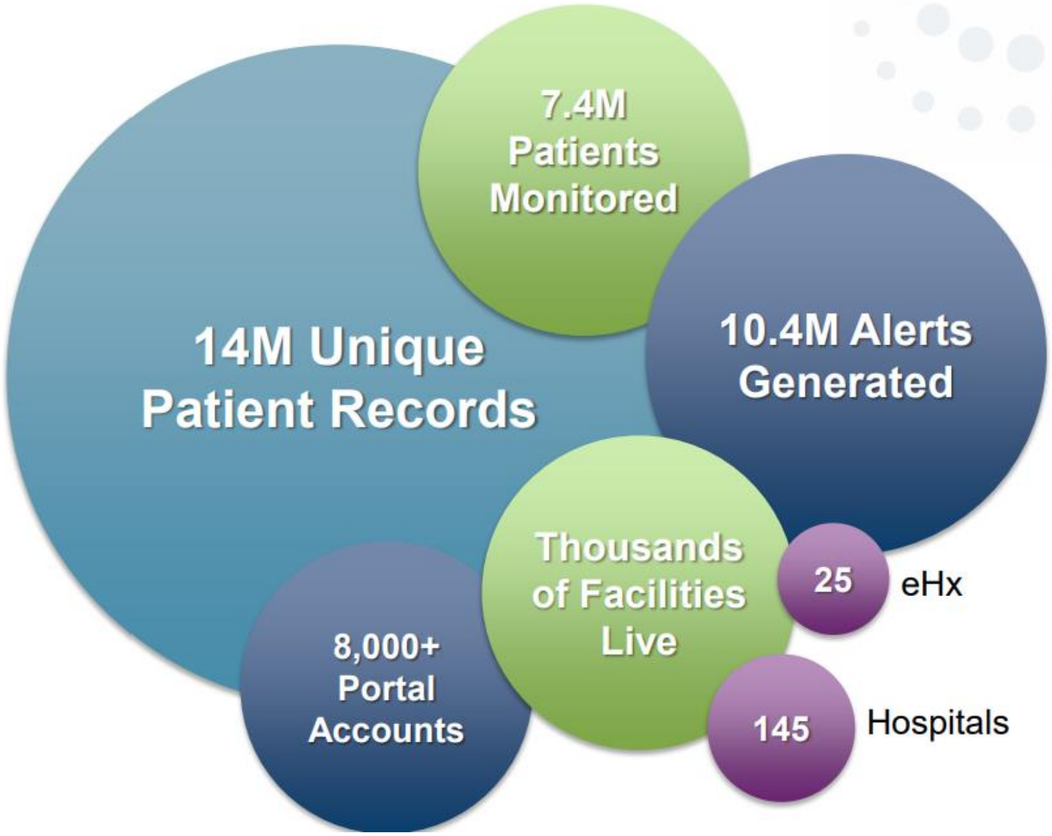
Artificial Intelligence: A set of technologies that enable machines to mimic human intelligence. SAS defines AI as the ability to automate complex tasks that require human like intelligence.

Data, Analytics & Artificial Intelligence

North Carolina Case Study

NC HealthConnex by the Numbers

- We have been operating since 2015. We have thousands of facilities live and sending data including 145 hospitals.
- We have over 14 million unique patient records, and are connected to 25 interstate and border states through the eHealthExchange which has data on DOD and the VA.
- According to the most recent numbers available, we are also monitoring 7.4 million patients through NC*Notify, generating 10.4 million alerts.

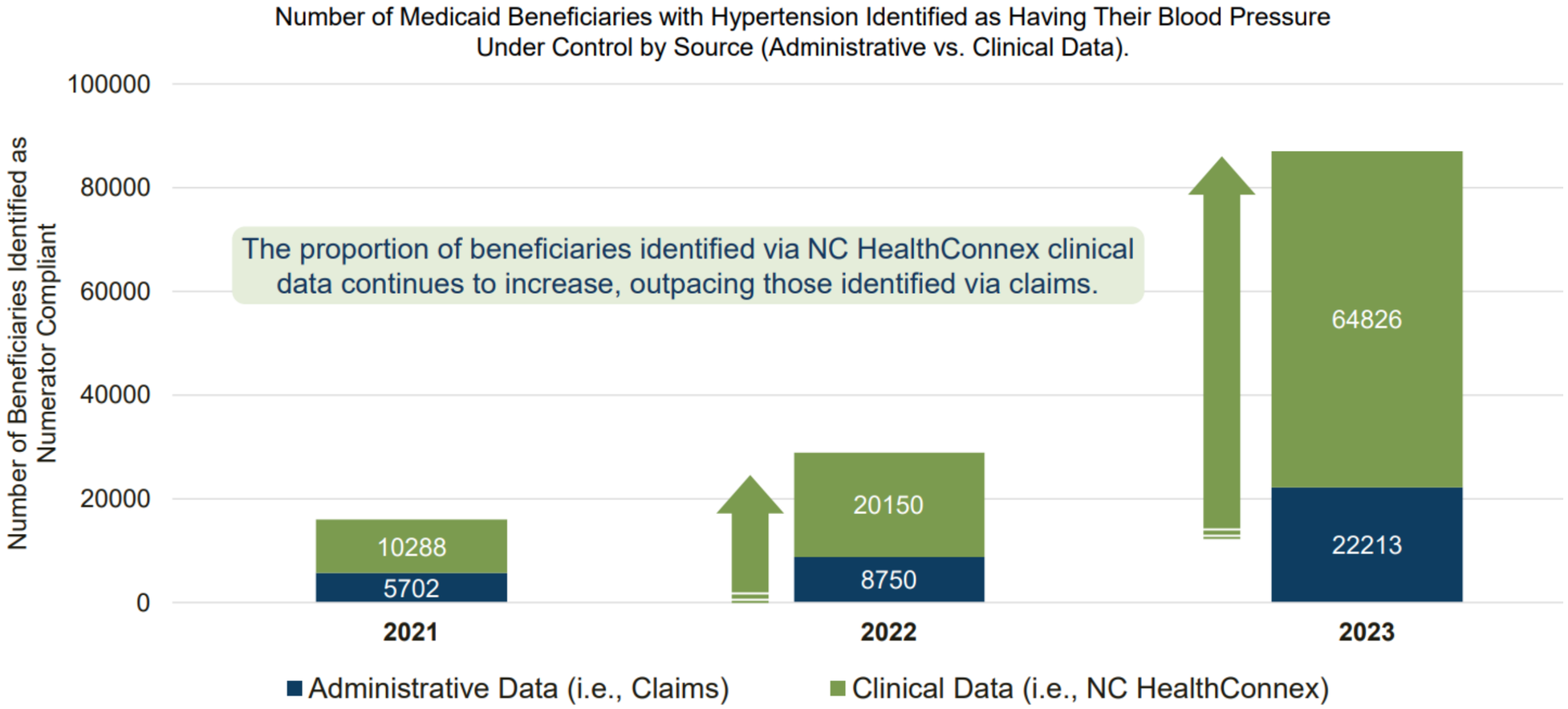


[Welcome to NC HealthConnex | NC HIEA]

Data, Analytics & Artificial Intelligence

North Carolina Case Study

A Deeper Look: The Impact of Clinical Data in Identifying Health Outcomes



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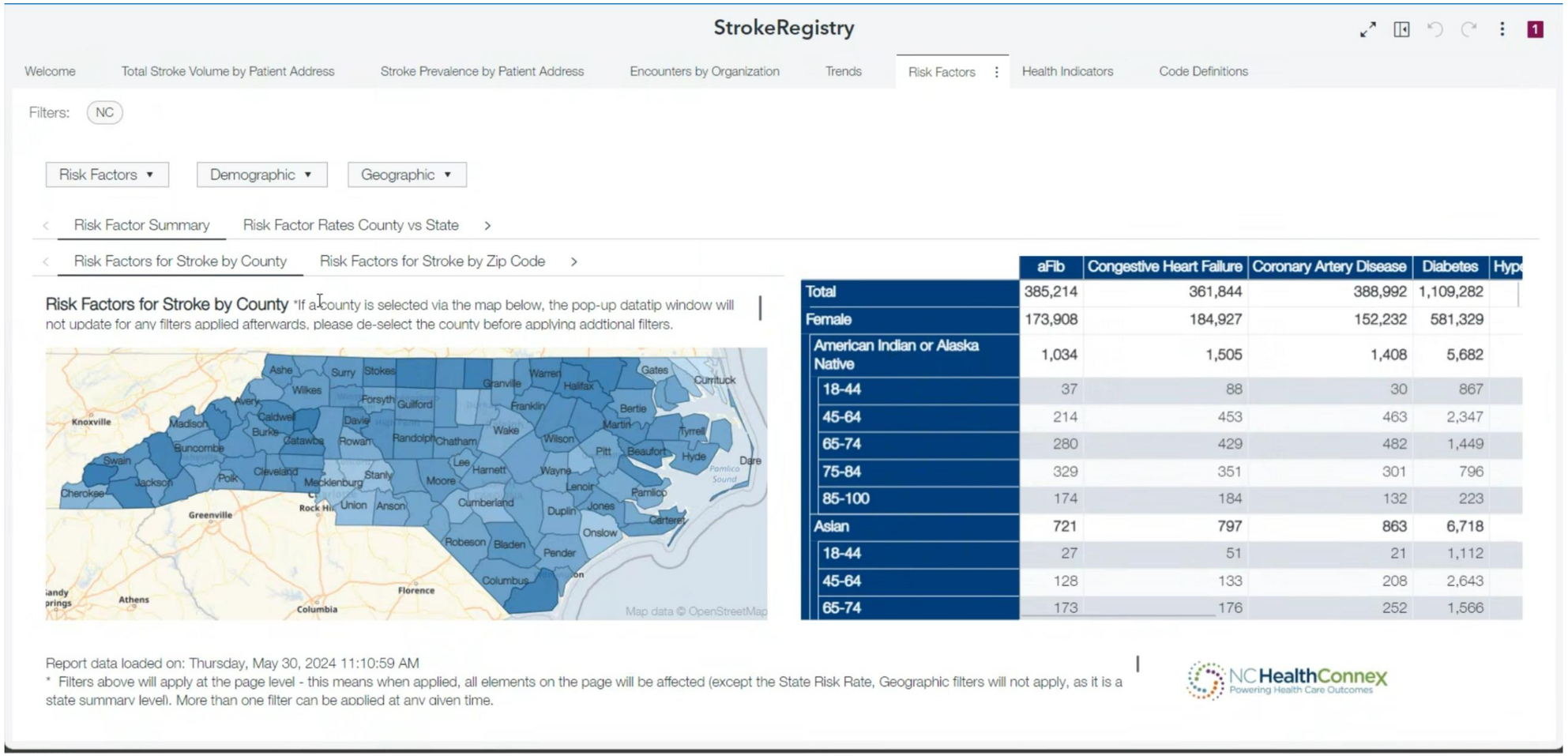
Data, Analytics & Artificial Intelligence

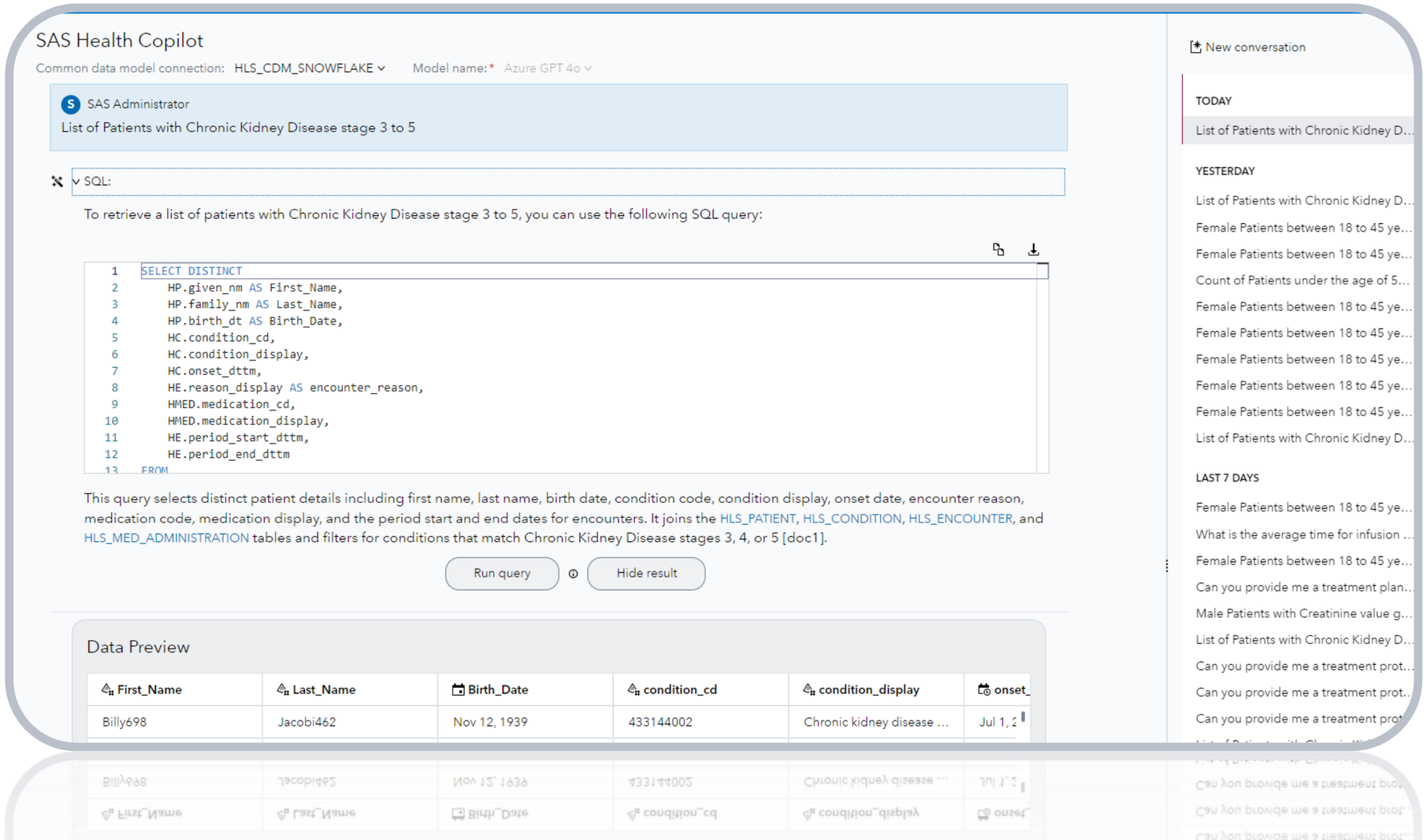
North Carolina Case Study



	aFib	Congestive Heart Failure	Coronary Artery Disease	Diabetes
Total	385,214	361,844	388,992	1,109,282
Female	173,908	184,927	152,232	581,329
American Indian or Alaska Native	1,034	1,505	1,408	5,682
18-44	37	88	30	867
45-64	214	453	463	2,347
65-74	280	429	482	1,449
75-84	329	351	301	796
85-100	174	184	132	223
Asian	721	797	863	6,718
18-44	27	51	21	1,112
45-64	128	133	208	2,643
65-74	173	176	252	1,566

Data, Analytics & Artificial Intelligence

North Carolina (under discussion)



Generative AI vs. Traditional AI

Traditional AI

- Traditional AI refers to systems that use algorithms to analyze data, detect patterns, and make predictions or decisions based on historical data.
- It excels at classification, forecasting, optimization, and decision automation.

Generative AI (GenAI)

- A subset of AI that creates new content—such as text, images, audio, or synthetic data—based on patterns learned from large datasets.
- It generates novel outputs in response to prompts, often using large language models (LLMs) or generative adversarial networks (GANs).

GenAI is not a replacement for traditional AI but a complement.

It is most powerful when integrated with governance, decisioning, and analytics lifecycle tools to ensure trustworthy, explainable, and business-aligned outcomes.

Breaking Down Artificial Intelligence

Artificial Intelligence (Sub-Fields)	Healthcare Application	Traditional or Gen AI?
Machine Learning	Predicting hospital re-admissions	Traditional AI
Computer Vision	Medical Imaging Analysis that measures effectiveness of cancer treatment (tumor size)	Traditional AI
Forecasting	Forecast Capacity (ICU Beds Covid)	Traditional AI
Optimization	EMS or mobile medical clinic van routing	Traditional AI
Natural Language Processing	Drafting clinical summaries from structured notes	Gen AI

What about CHAT GPT?

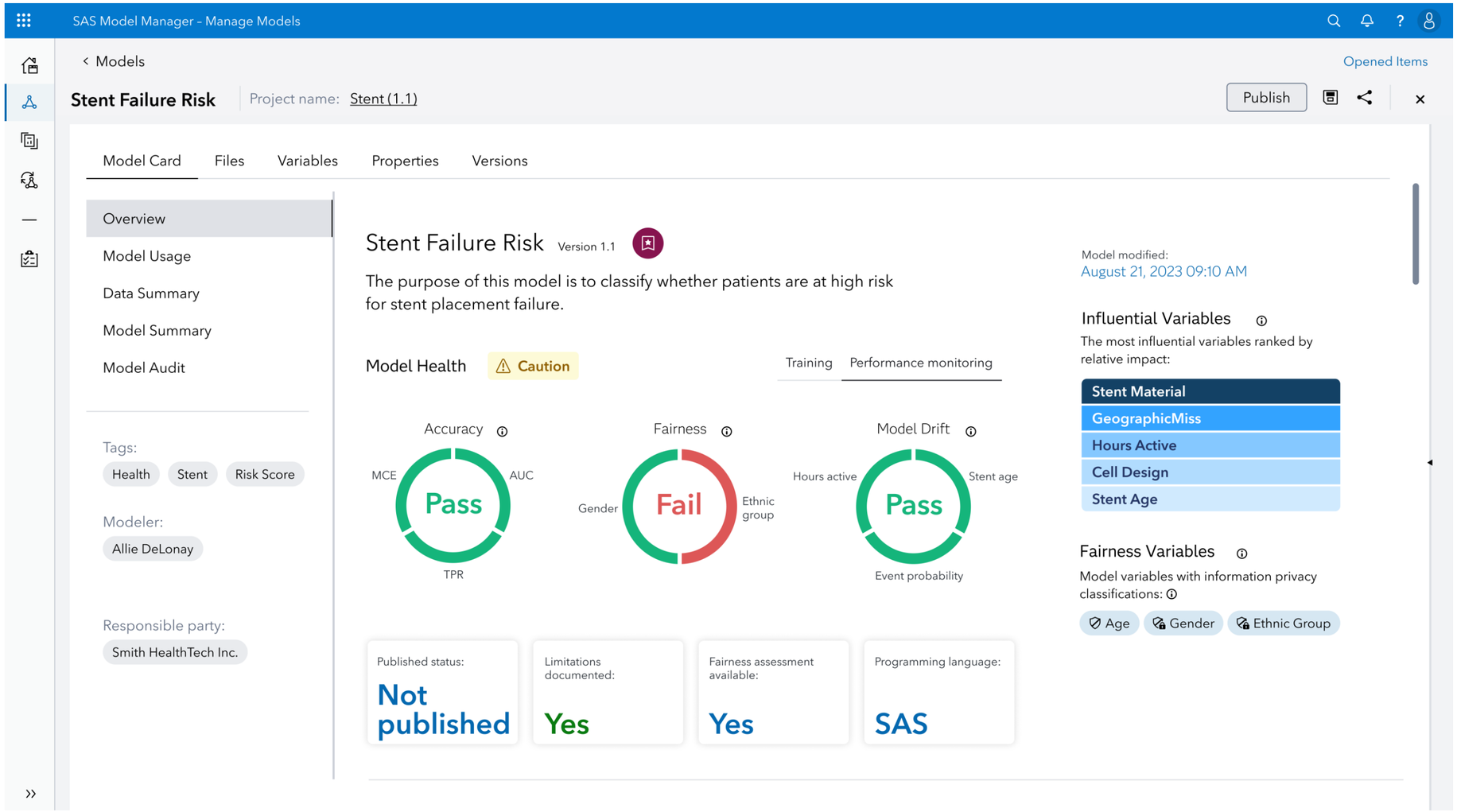
Chat GPT is GenAI.

Chat GPT is a just one of many large language models (LLM) within natural language processing (NLP) that is trained on massive amounts of data to predict and generate human-like language/responses.

There are also many non-healthcare and healthcare companies that specialize in NLP.

SAS is using MS Copilot for NLP.

What is Trustworthy AI?



Traditional or GenAI?

Generating clinical summaries for transitions of care.

Traditional or GenAI?

Generating clinical summaries for transitions of care.

GenAI. LLMs are used to gather data from various sources (progress notes, labs, imaging results, medications (EHR), dictations, diagnoses vital signs, problems lists. Relationships between the clinical terms are made. Once the AI understands inputs, it uses NLP to write a summary which is validated by clinicians before incorporated into workflow.

Traditional or GenAI?

Monitoring and evaluating chronic wounds, burns or ulcers.

Traditional or GenAI?

Monitoring and evaluating chronic wounds, burns or ulcers.

Traditional. Computer vision can be used to measure wound size, detect infection signs, and track healing progress over time.

Traditional or GenAI?

Identifying patients likely to no show at their clinic appointment.

Traditional or GenAI?

Identifying patients likely to no show at their clinic appointment.

Traditional. Machine Learning models can be trained on historical appointment data, such as age and gender, time of appointment, no show history, distance to clinic, weather forecast, insurance type, to identify risk of a no show.

Traditional or GenAI?

Generating personalized health education materials.

Traditional or GenAI?

Generating personalized health education materials.

GenAI. LLMs are used to gather data from various sources (diagnosis, condition, demographics, health literacy, care plan and treatment details). Using natural language understanding, the patient's treatment journey is analyzed to highlight relevant educational topics, the medical terminology and education plan is translated to layman's terms, and natural language is generated to create custom education content with condition summary, and care instructions.

Analytics Maturity – Climbing the Analytics Ladder

Integrated Deployment

Automate the end-to-end process of deploying models and decisions, enabling optimal time-to-value of analytics.

Model Management

Consistently and safely develop, validate, deliver & monitor models that create a competitive advantage.

AI / Machine Learning

Utilize machine learning models to learn from data without relying on rule-based programming.

Modeling

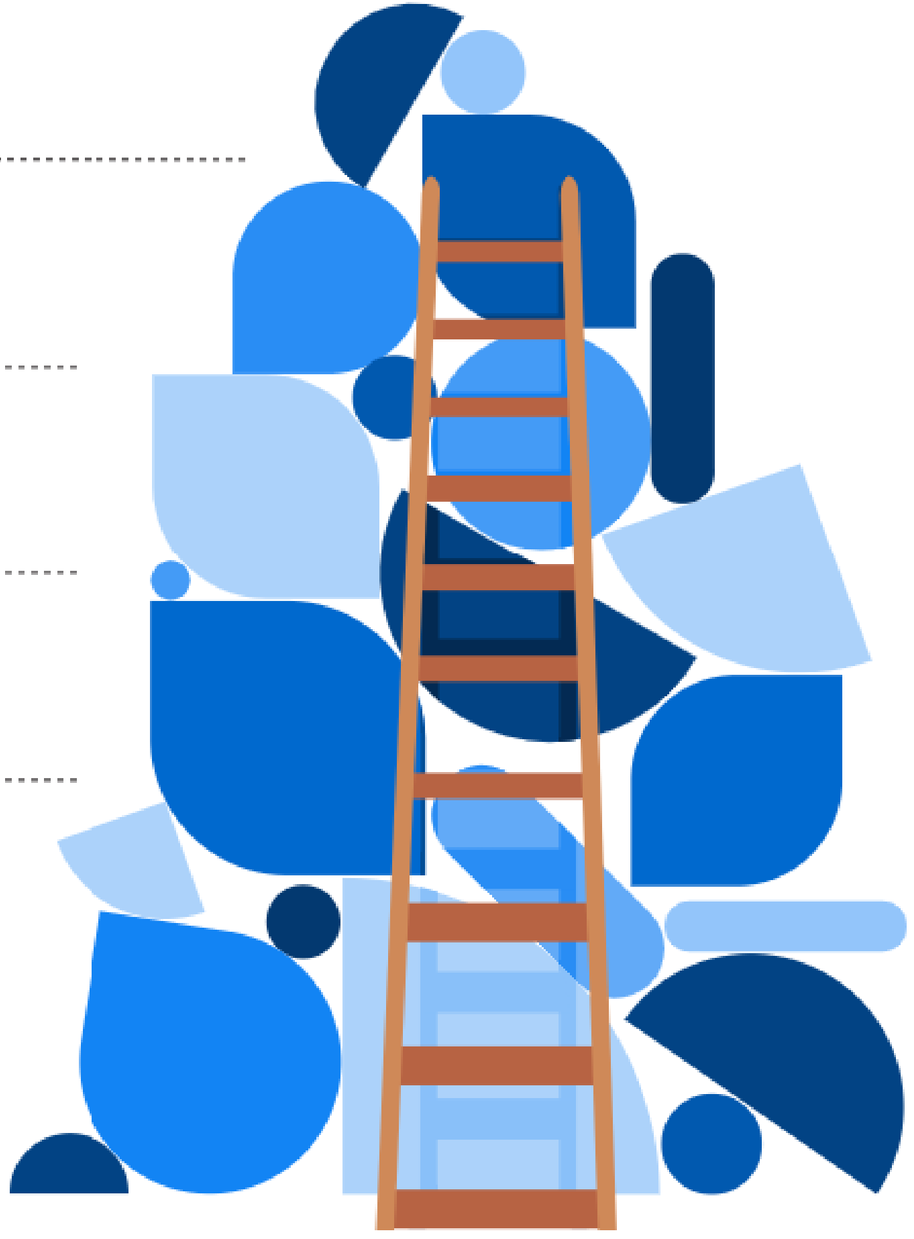
Create a mathematical representation of the variables in your observed data and their underlying relationships.

Data Exploration & Visualization

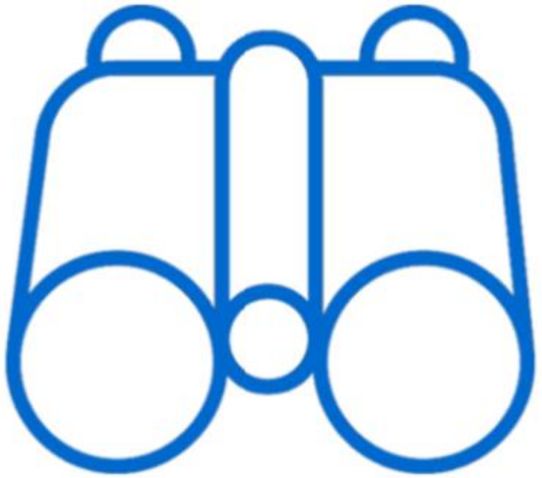
Use charts and traditional data mining techniques to uncover initial patterns, characteristics and general points of interest.

Data Preparation

Automate the integration, standardization, and transformation of any data for use in down-stream processes.



GenAI Maturity Assessment



Observer

Observers are interested in GenAI's potential and are considering how they can best use it to their advantage. They work for organizations where GenAI hasn't been implemented, or only minimally, but the vast majority show interest in adopting the technology when the time is right. Along with working towards their first pilot tests and use cases, most Observers' organizations need to prepare for GenAI regulation, establish governance frameworks and build training programs for staff in order to start effectively and responsibly harnessing the power of this new technology.

https://www.sas.com/content/dam/SAS/documents/marketing-whitepapers ebooks/ebooks/en/generative-ai-global-research-report-113914.pdf

Data & Analytics Case Studies

Advancing Patient & Population Health

Large US Payer, Healthcare Delivery

500,000 medical records per Year
1400 average pages per record
40+ minutes to manually review each record

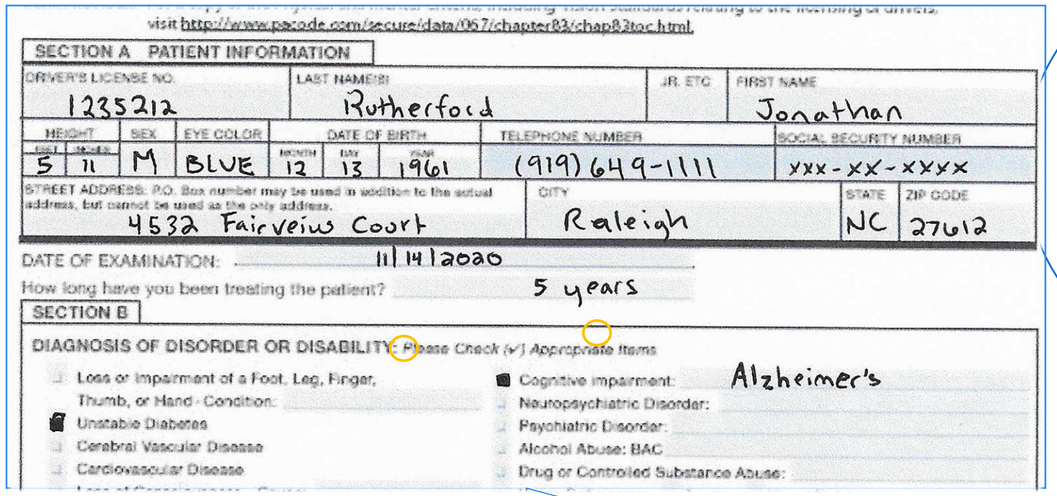
A federal health services division at a large US payer, faced a critical challenges: how to efficiently process the massive volume of medical records required for veteran's prior authorization and disability evaluations. This delayed veteran's access to timely care and benefits.

By leveraging SAS AI for Medical Record Review which converts medical record scans into structured, bookmarked data, clinicians can quickly navigate to find key information required for authorizations.

Results

1. 11 Million images processed daily
2. 70% efficiency gained
3. $12M in estimated savings (>800,000 FTE hours/year or 350-400 additional FTEs/year would be required to match throughput)

Example: Extraction to Actionable Data



visit http://www.pacode.com/secure/data/067/chapter83/chap83toc.html.

SECTION A PATIENT INFORMATION

DRIVER'S LICENSE NO.	LAST NAME(S)	JR. ETC	FIRST NAME
1235212	Rutherford		Jonathan

HEIGHT		SEX	EYE COLOR	DATE OF BIRTH			TELEPHONE NUMBER	SOCIAL SECURITY NUMBER
FEET	INCHES			MONTH	DAY	YEAR		
5	11	M	BLUE	12	13	1961	(919) 649-1111	xxx-xx-xxxx

STREET ADDRESS: P.O. Box number may be used in addition to the actual address, but cannot be used as the only address.	CITY	STATE	ZIP CODE
4532 Fairveius Court	Raleigh	NC	27612

DATE OF EXAMINATION: 11|14|2020

How long have you been treating the patient? 5 years

SECTION B

DIAGNOSIS OF DISORDER OR DISABILITY: Please Check (✓) Appropriate Items

- ☐ Loss or Impairment of a Foot, Leg, Finger, Thumb, or Hand - Condition:
- ☐ Unstable Diabetes
- ☐ Cerebral Vascular Disease
- ☐ Cardiovascular Disease
- ☑ Cognitive Impairment: Alzheimer's
- ☐ Neuropsychiatric Disorder:
- ☐ Psychiatric Disorder:
- ☐ Alcohol Abuse: BAC
- ☐ Drug or Controlled Substance Abuse:

Form structures can cause lost context when using standard import facilities

```
SECTION A PATIENT INFORMATION
DRIVER'S LICENSE NO. LAST NAME(B) JR ETC FIRST NAME
1235Z12 RUTHERFORD JONATHAN
HEIGHT SEX EYE COLOR DATE OF BIRTH TELEPHONE NUMBER SOCIAL SECURITY NUMBER
FEET INCHES M BLUE MONTH DAY YEAR (919)649-LLLL XXX-XX-XXXX
5 11 12 13 1970
STREET ADDRESS P.O. BOX NUMBER MAY BE USED IN ADDITION TO THE ACTUAL CITY STATE ZIP CODE
ADDRESS, BUT CANNOT BE USED AS THE CITY ADDRESS. NC 27612
4532 FAIRHAVEN COURT RALEIGH
DATE OF EXAMINATION: 11|14|2020
HOW LONG HAVE YOU BEEN TREATING THE PATIENT? 5 YPARS
SECTION B
DIAGNOSIS OF DISORDER OR DISABILITY: PLEASE CHECK (V) APPROPRIATE ITEMS
LOSS OR IMPAIRMENT OF A FOOT, LEG, FINGER, COGNITION IMPAIRMENT:
THUMB, or HAND - CONDITION: NEUROPSYCHIATRIC DISORDER:
UNSTABLE DIABETES PSYCHIATRIC DISORDER:
CEREBRIAL VASCULAR DISEASE ALCOHOL ABUSE: BAC
```

AI allows for maintaining the structure leading to actionable, normalized output

Doc ID	License	Lastname	Firstname	DOB	Limb_Loss1	Unstable_Diab	Cog_Impair
1201	1235212	Rutherford	Jonathan	12/13/1961	NO	YES	Alzheimer's

By 2030, diabetes will affect over 54.9 million Americans (16% of the population)*. Medication adherence is one way to control this number and the costs associated with this trend.

Medication Adherence Risk Prediction

A large US-based health plan analyzed their data related to medication adherence for diabetes patients. With the health plan's goal of using predictive analytics to bring the best to their members, this analysis helps them be more proactive in identifying those members at risk for non-adherence and putting programs in place to avoid that from happening.

Key Takeaways

1. Using SAS modeling algorithms, the plan identified the most important factors that drive medication adherence in their diabetes patients.

2. The model predicts who will still be adhering to their diabetes medication at the end of a year, given their behaviors during the first 3 months of that year.

3. Findings might inform actionable programs that the plan can put into place to help their members be healthier and help reduce costs.

* Source:
Center for Disease Control and Prevention, Long Term Trends in Diabetes, April 2017

Medication Adherence Risk Prediction

Predict Med Adherence VA Demo

Opened reports (1)

New Users Risk | Model Score Fit Statistics | Definitions

Filters: No selections

Member Category: Non Adherent Flag

Pharmacy ID: Enter Top Pharmacy ID...

Ordering Provider ID: Enter Top Ordering Provider ID...

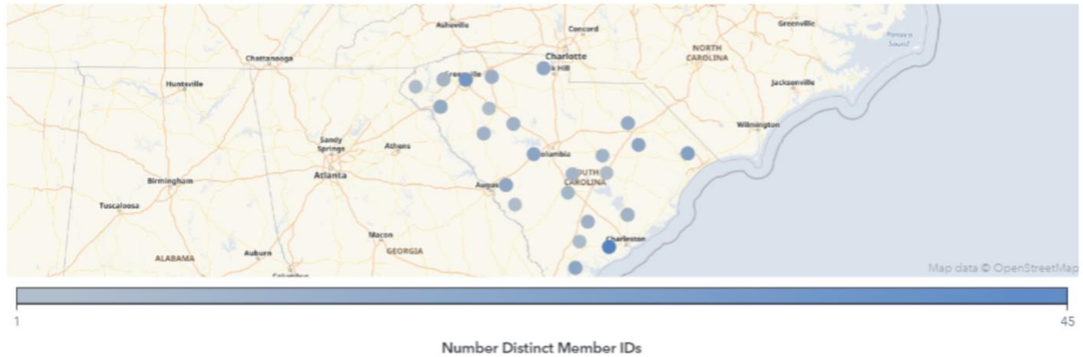
Member ID: Enter Member ID...

Members Initiating Central Nervous System Drugs

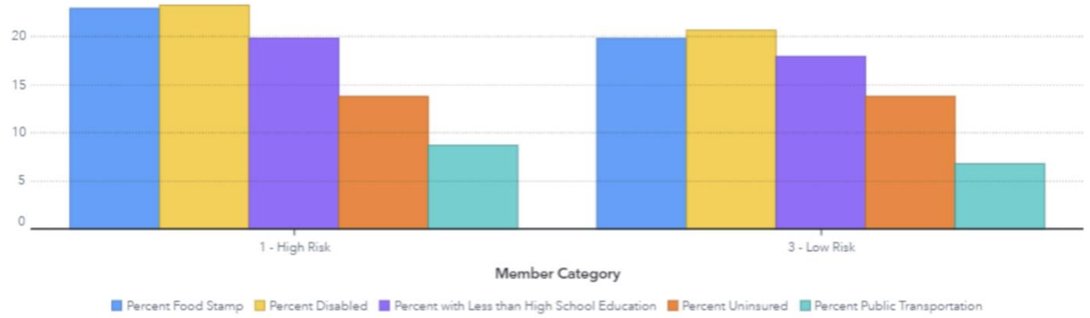
Member Details | Comparison of Risk by County and Top Pharmacy | Comparison of Risk by County and Top Prescriber

Non Adherent Flag	Probability Non-Adherent	Member ID	Patient Age	Member Gender	Member Race	Member County	Member State	Top Ordering Provider ID	Top Pharmacy ID	Historical Total Amount Paid on Pharmacy Claims	Historical Number Distinct Pharmacies	Historical Number Distinct Pharmacy Claims	Historical Number Facility Stays	Historical Number Distinct Ordering Providers
HighRisk	0.84	63325	45	F	BLACK	Beaufort	SC	1640	19792	$58	5	7	0	2
HighRisk	0.95	46879	32	F	WHITE	Aiken	SC	2482	19706	$95	2	7	0	2
HighRisk	0.82	52341	30	F	WHITE	Florence	SC	5229	19280	$130	2	2	0	1
HighRisk	0.83	860	46	F	WHITE	Sumter	SC	16014	19294	$224	2	3	0	1
HighRisk	0.90	27910	45	M	WHITE	Beaufort	SC	13170	19853	$62	2	3	0	1
HighRisk	0.94	11632	52	F	WHITE	Lexington	SC	4830	19213	$154	2	7	7	3

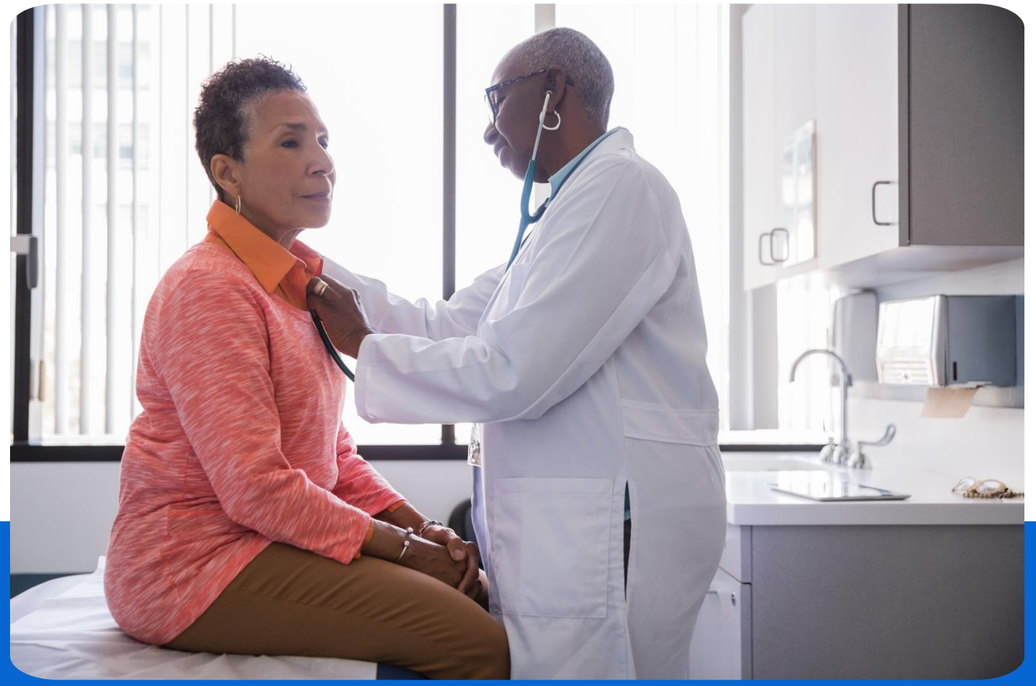
Non-Adherence Risk by Member County



Social Drivers of Health - Percents | Social Drivers of Health - Counts

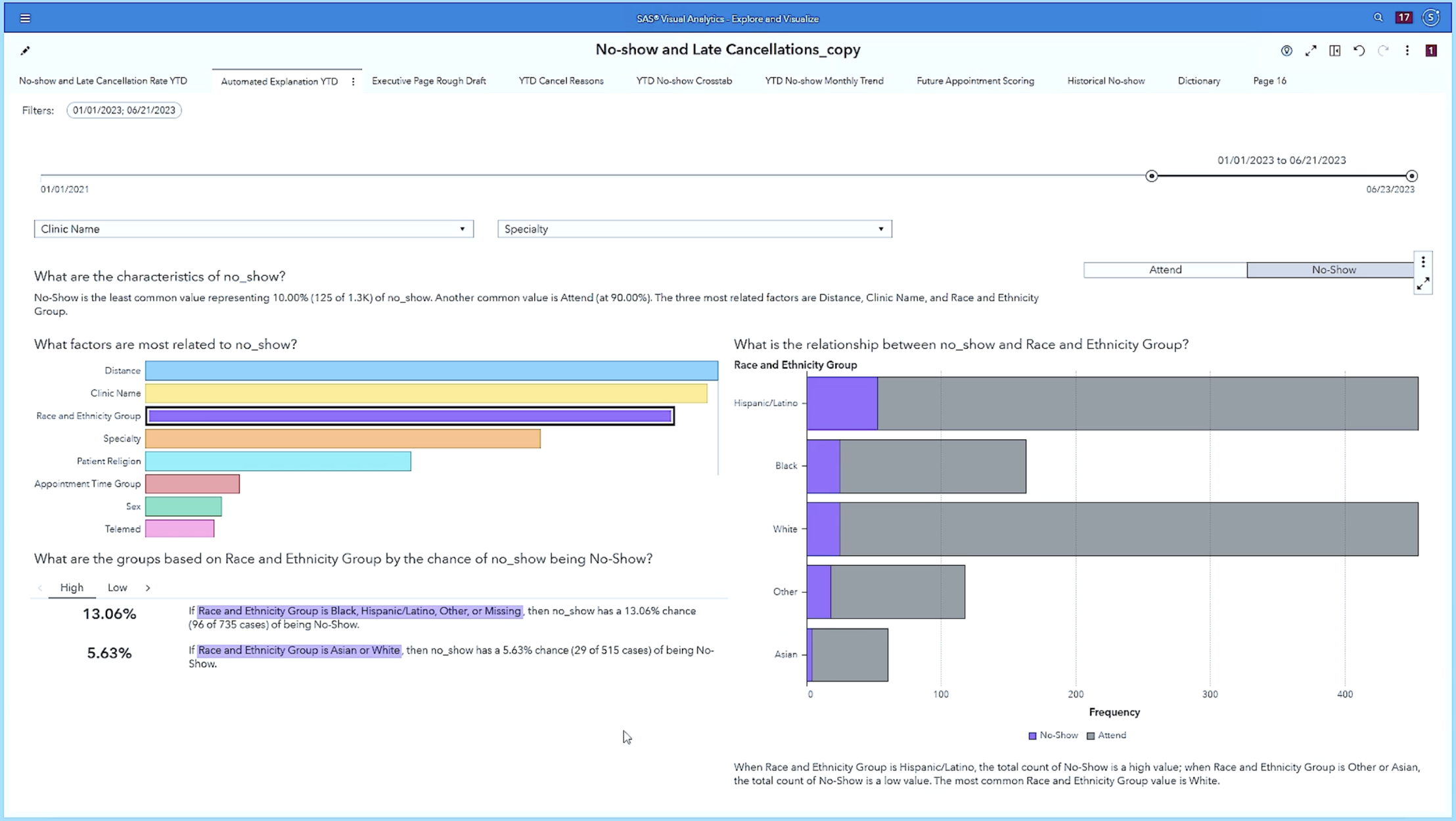


Emirates Health System is using predictive analytics to reduce no shows.

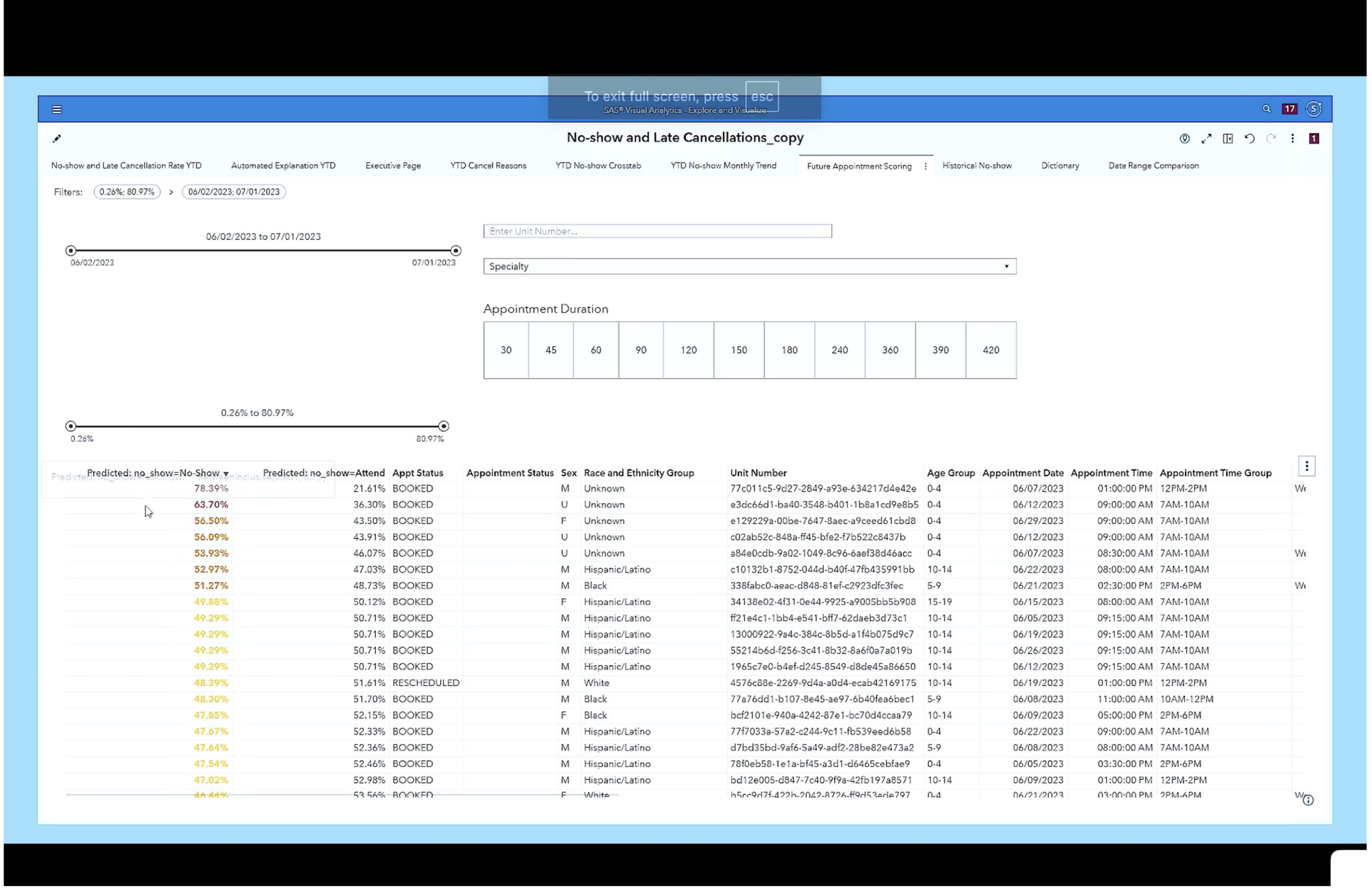


EHS used SAS Model Studio to predict appointments that are at risk of being no shows. Patients failing to show for clinic appointments significantly affected delivery, cost of care & resource planning.

No show appointments were based on a variety of factors, including clinical area of service, time of appointment, and new vs. follow up appointment. Care Providers & registration clerks were able to identify patient flagged by the model, so they could be managed more efficiently, buy converting their in-person appointment so virtual visits, or in cases of potential no-show by proactively calling them to cancel or rescheduled according to their preference.



[Pinnacle No-Show Predictor, powered by SAS]



[Pinnacle No-Show Predictor, powered by SAS]

Mobile Medical Van Routing

A healthcare delivery arm at a large US payer, operates a fleet of mobile medical units to serve patients who cannot easily travel to care facilities. These units provide both routine and specialized services (e.g., audiology, opthamology). SAS was used to optimize site selection and routes, so more patients would have access to clinicians available on mobile routes.

The objective was to increase the number of patient's seen, reduce clinician travel time, and improve access to care

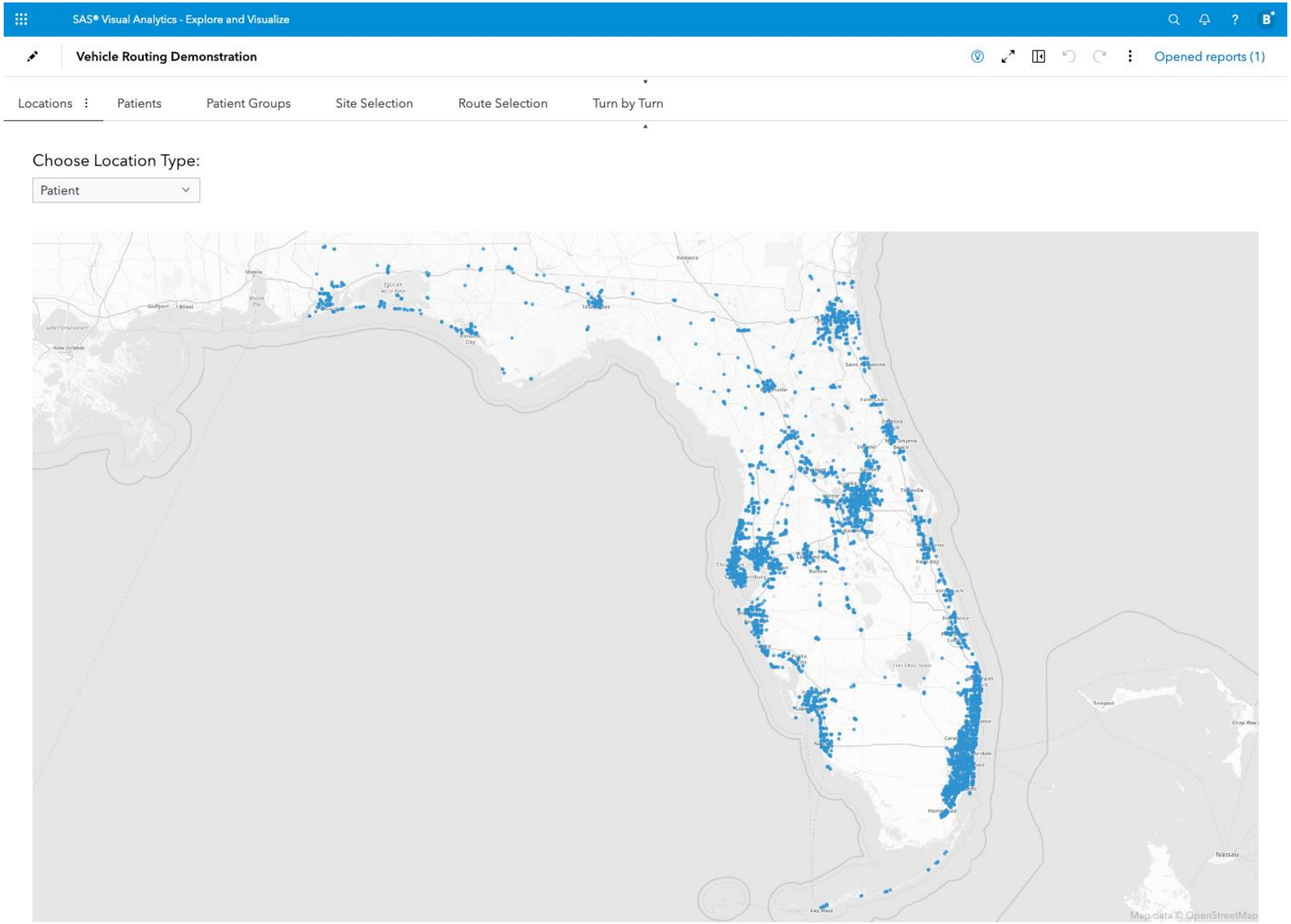
Key Takeaways

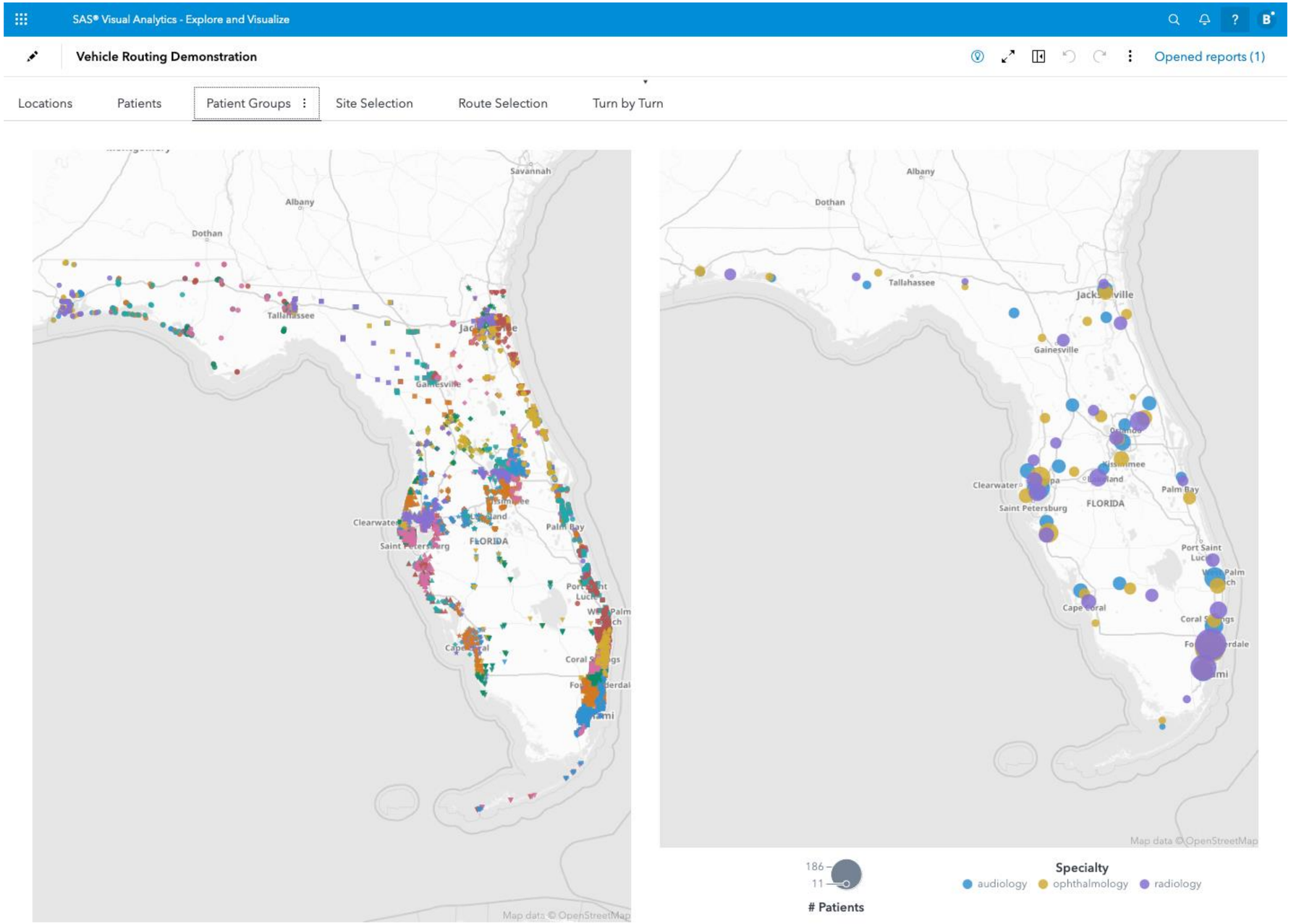
1. Patients and patient's requiring specialized services, along with healthcare delivery organizations, and community service locations, were mapped out based on their geographical locations.

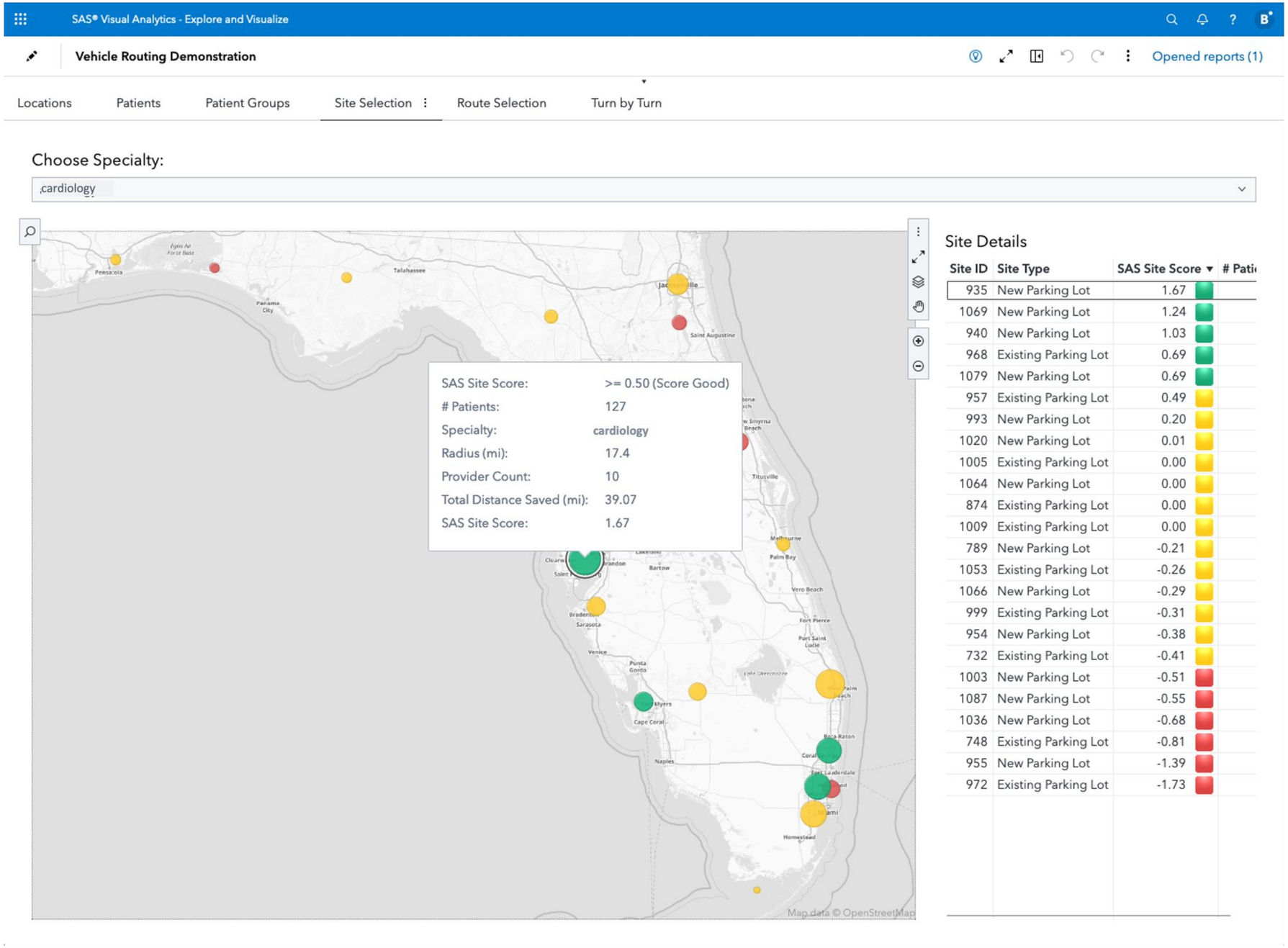
2. Technologies such as Loqate were employed to enhance the precision of patient location.

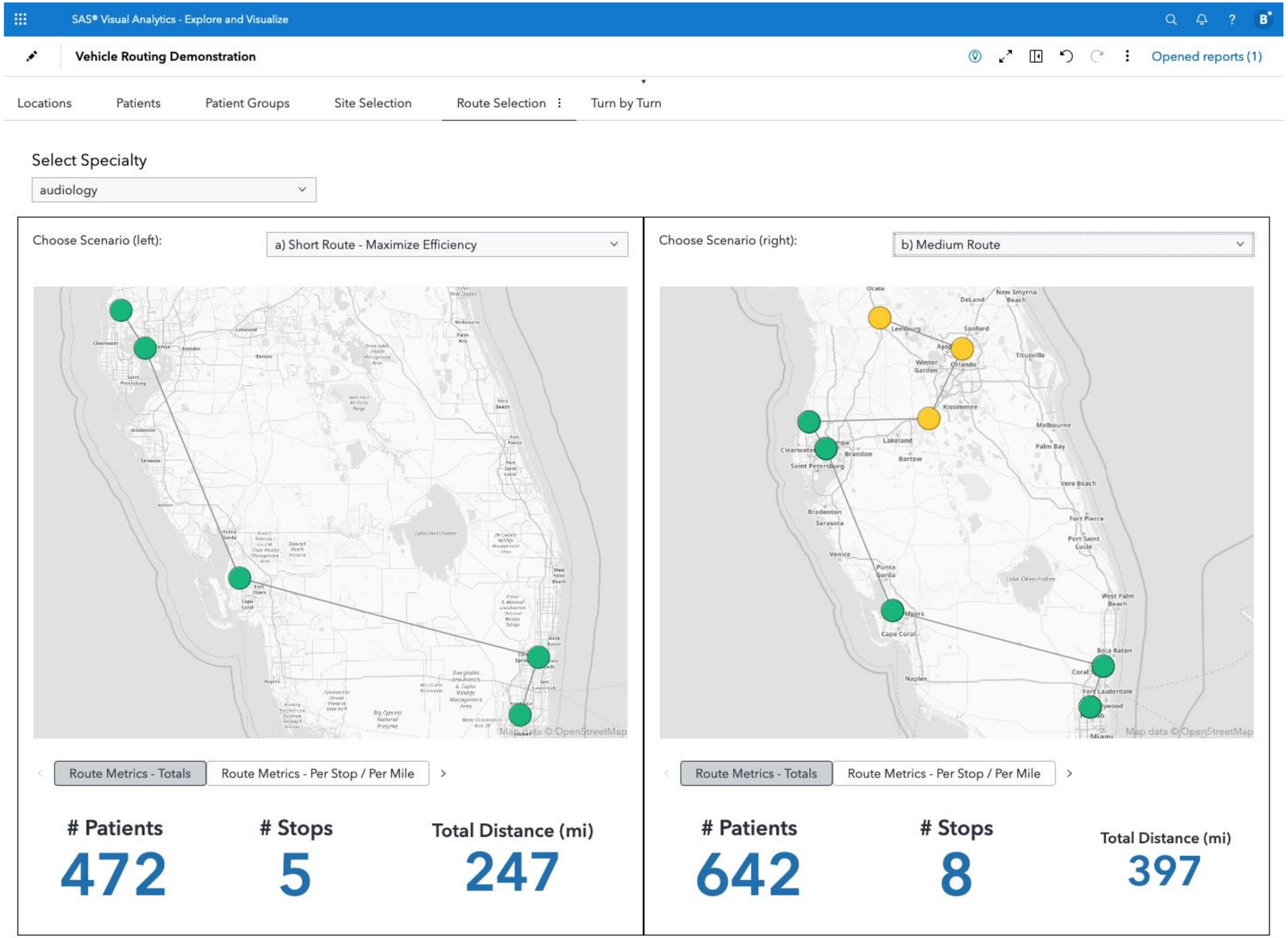
3. SAS was utilized to create routing optimization models that incorporate geolocation, network community detection, and patient clustering, allowing for the scoring and prioritization of potential service locations.

4. SAS was utilized to create visualizations that enabled decision-makers to see various route alternatives and their effects on the number of patients served.









Key Takeaways

Analytics involves analyzing data to uncover meaningful patterns, trends, or insights

AI involves building systems that can mimic human intelligence

GenAI is a sub-set of AI

ChatGPT is one of many GenAI tools available

Although GenAI is generating interest within the industry, healthcare providers are carefully experimenting with it rather than fully adopting it.

In comparison, analytics and traditional AI have more extensive applications in healthcare to tackle various needs.

It is crucial to ensure governance and trustworthy AI for accurate and unbiased insights from these models.

Matthew Schirmer MSW

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GenAI Maturity Assessment

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